

HEARING SYSTEM BEAMFORMER

Inventor Jon C. Taenzer

Serial No. 10/812,718

Filing Date March 29, 2004

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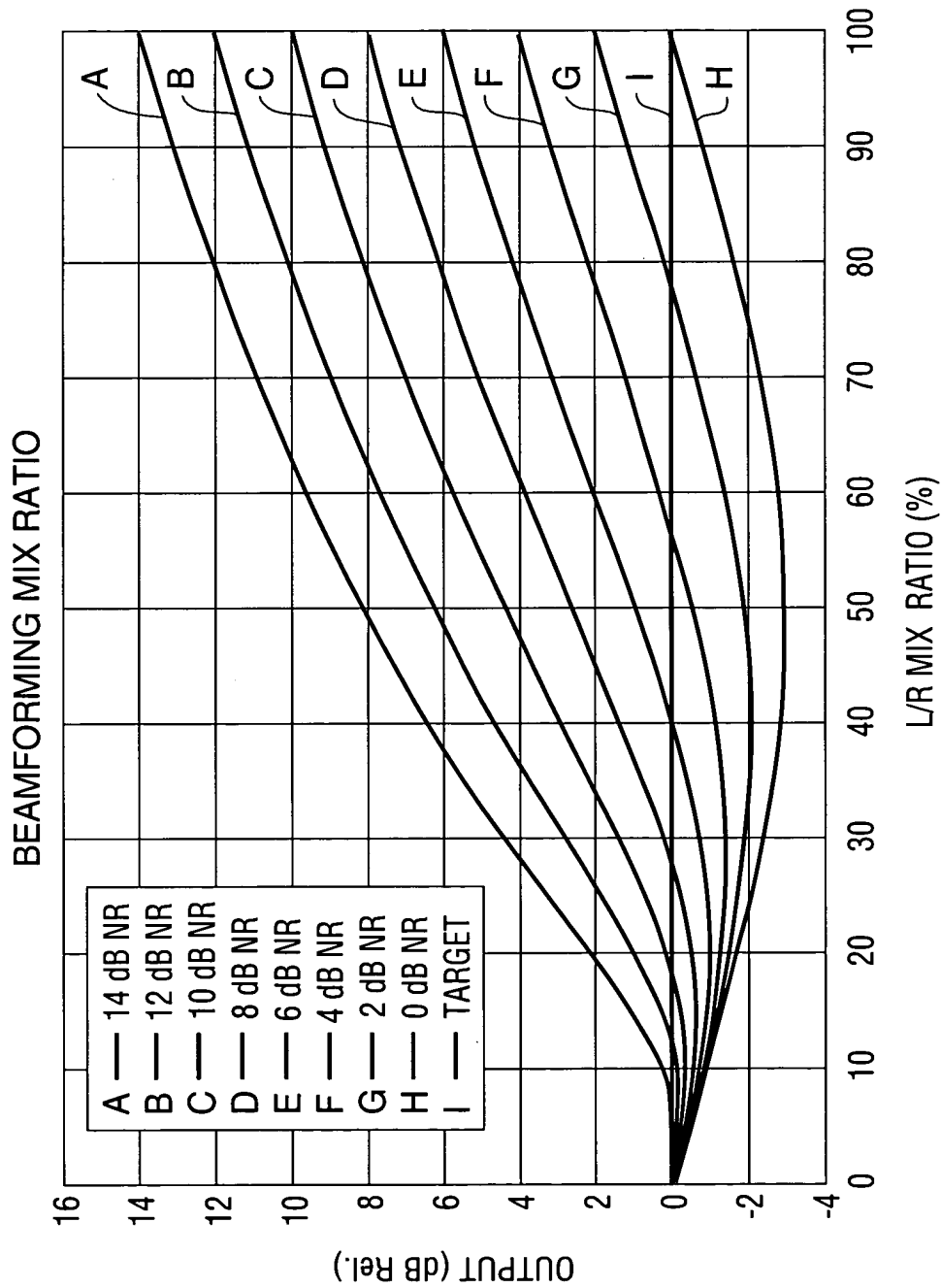


FIG. 1

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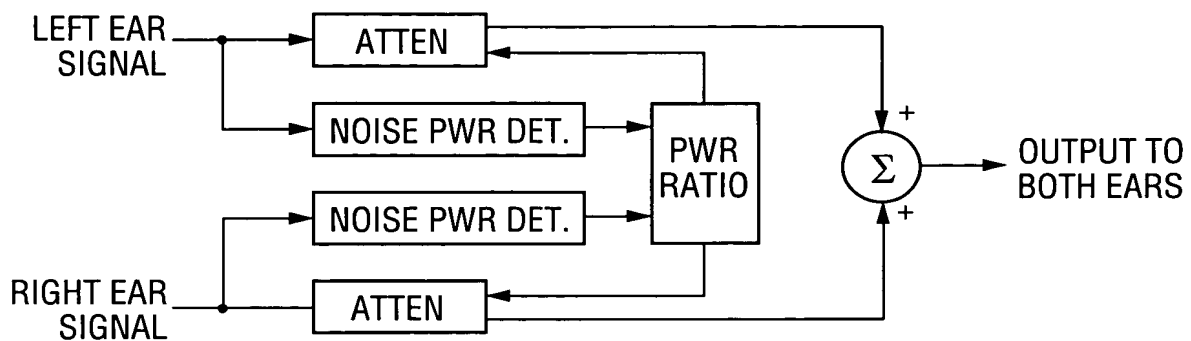


FIG. 2

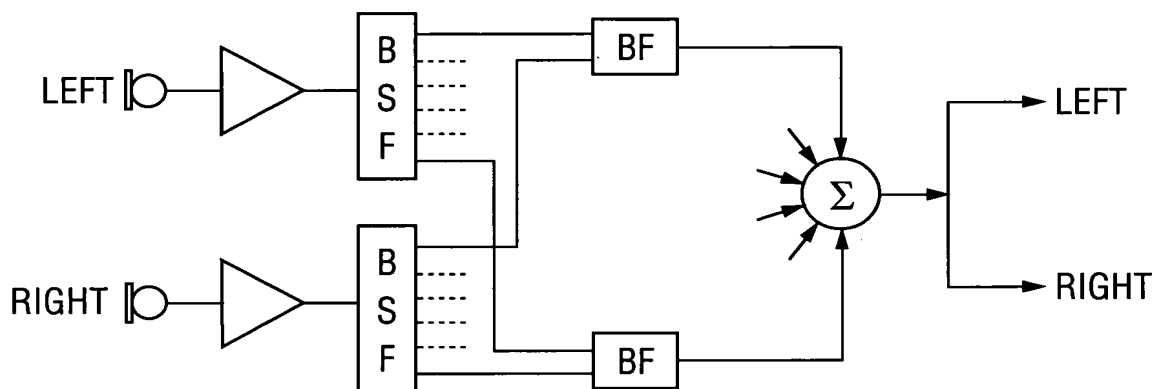


FIG. 7

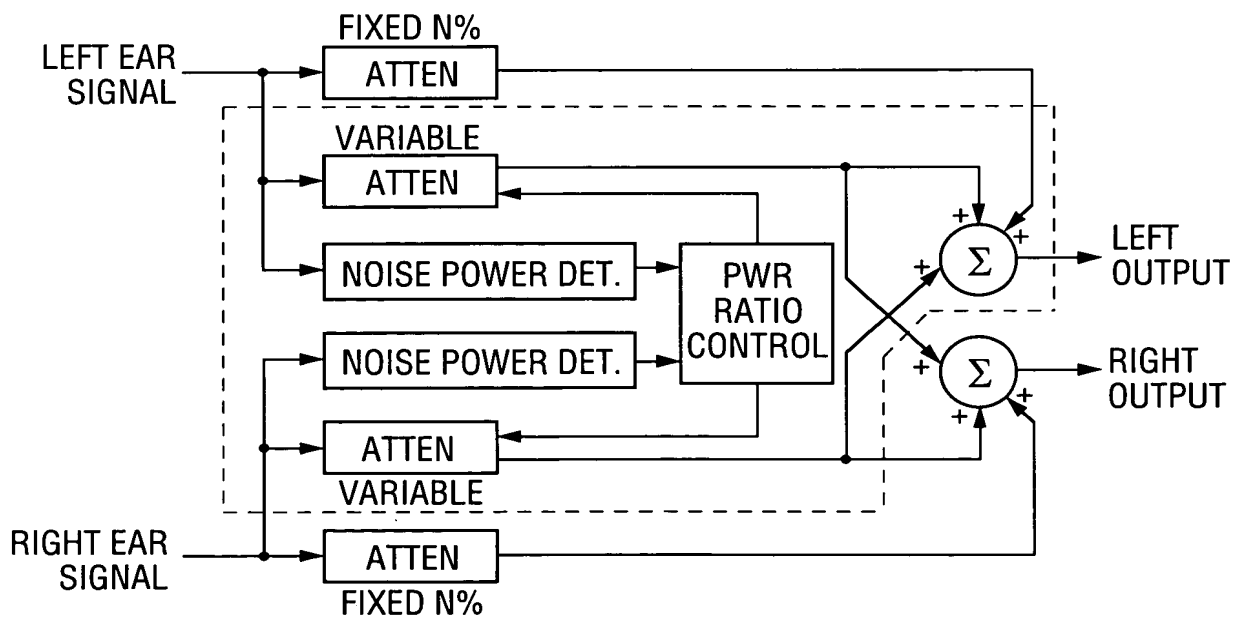


FIG. 8

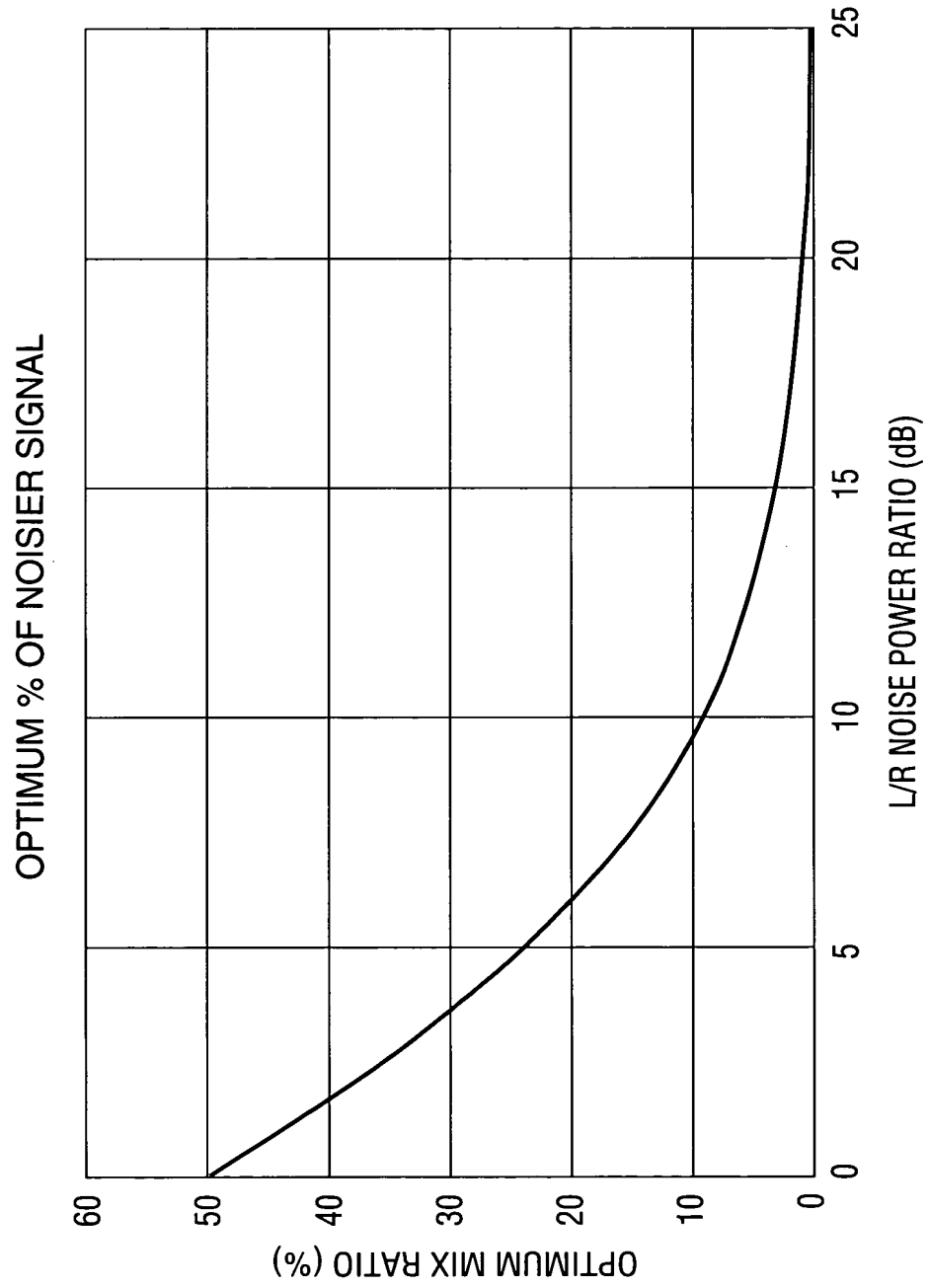


FIG. 3

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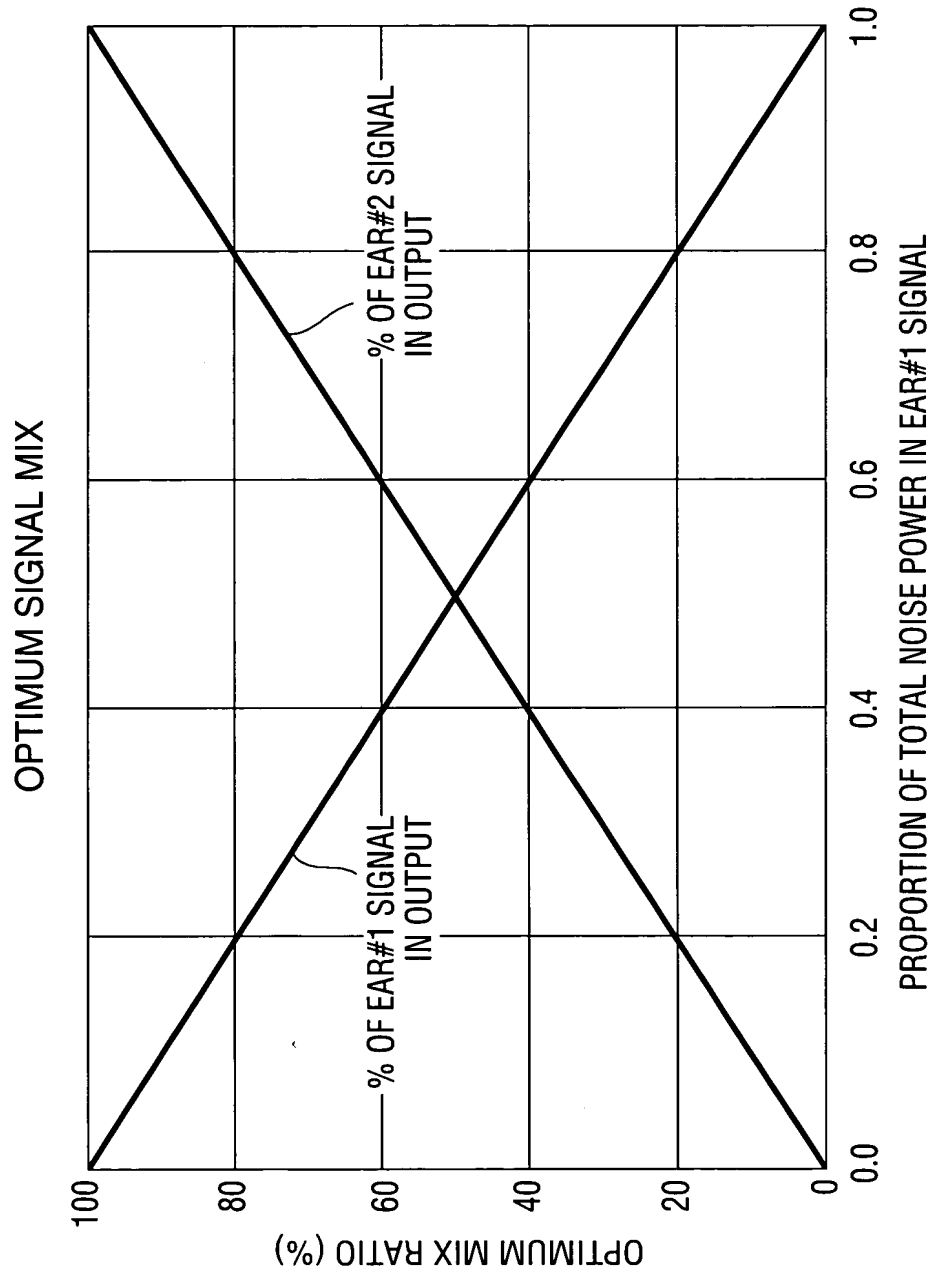


FIG. 4

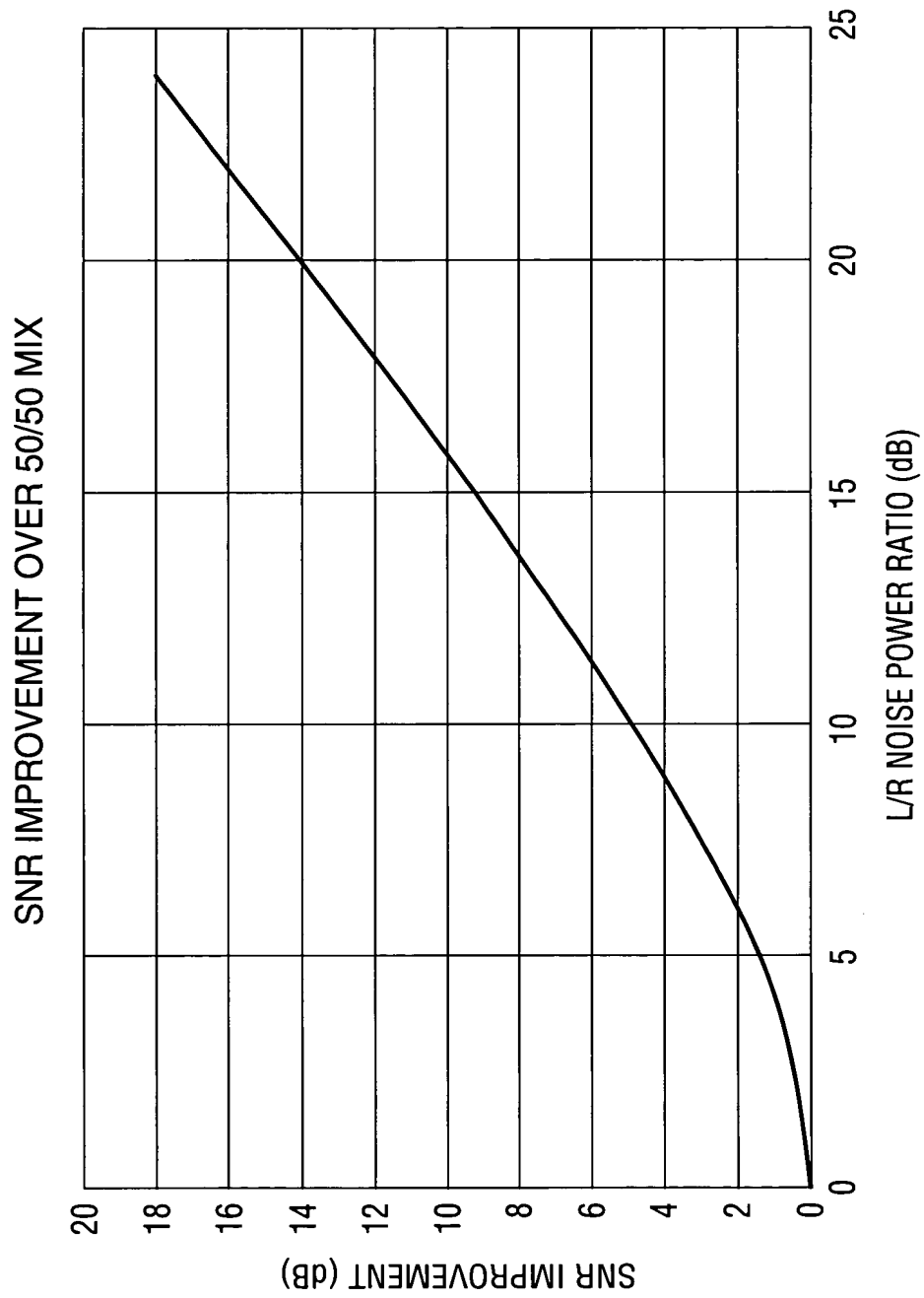


FIG. 5

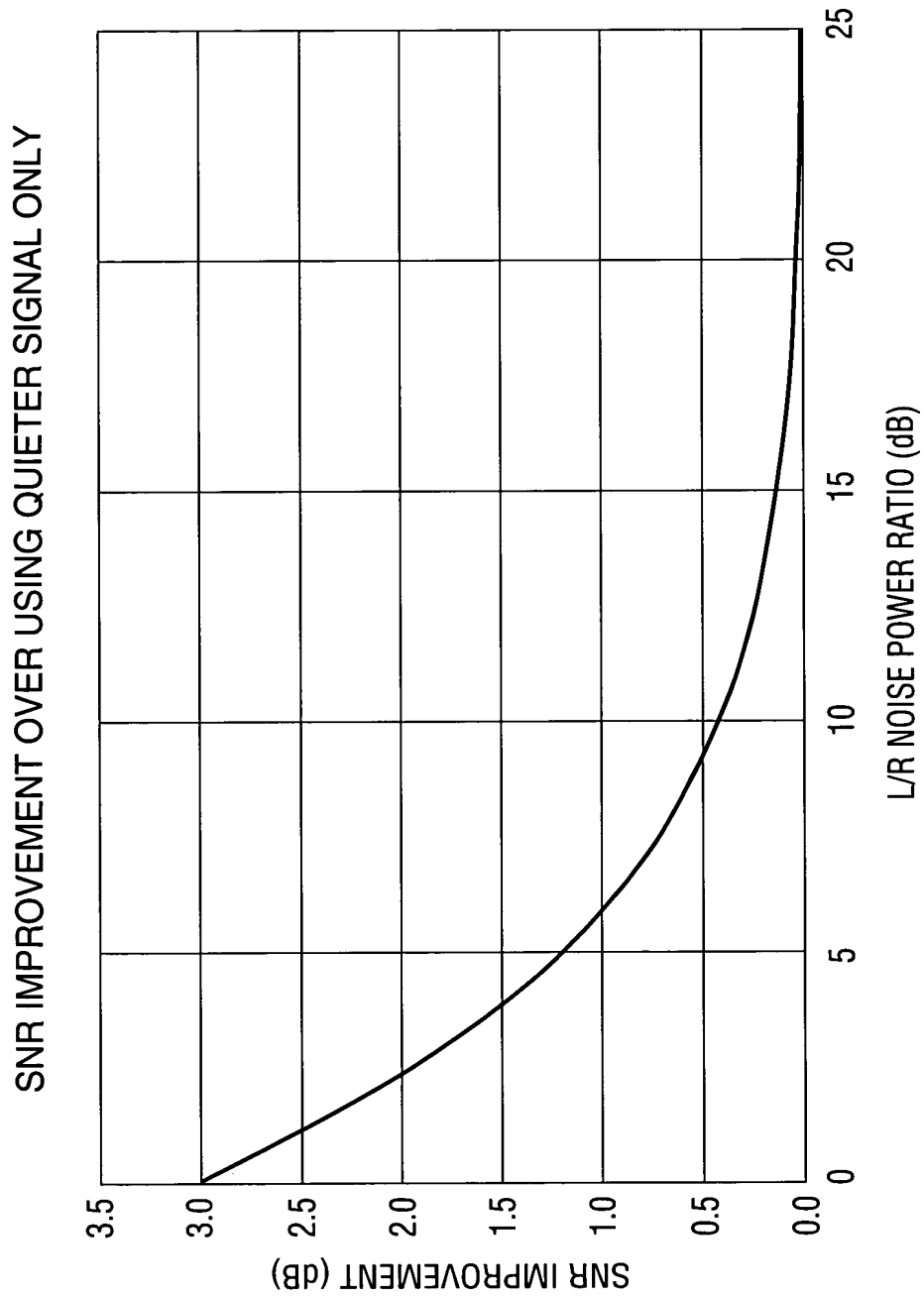


FIG. 6

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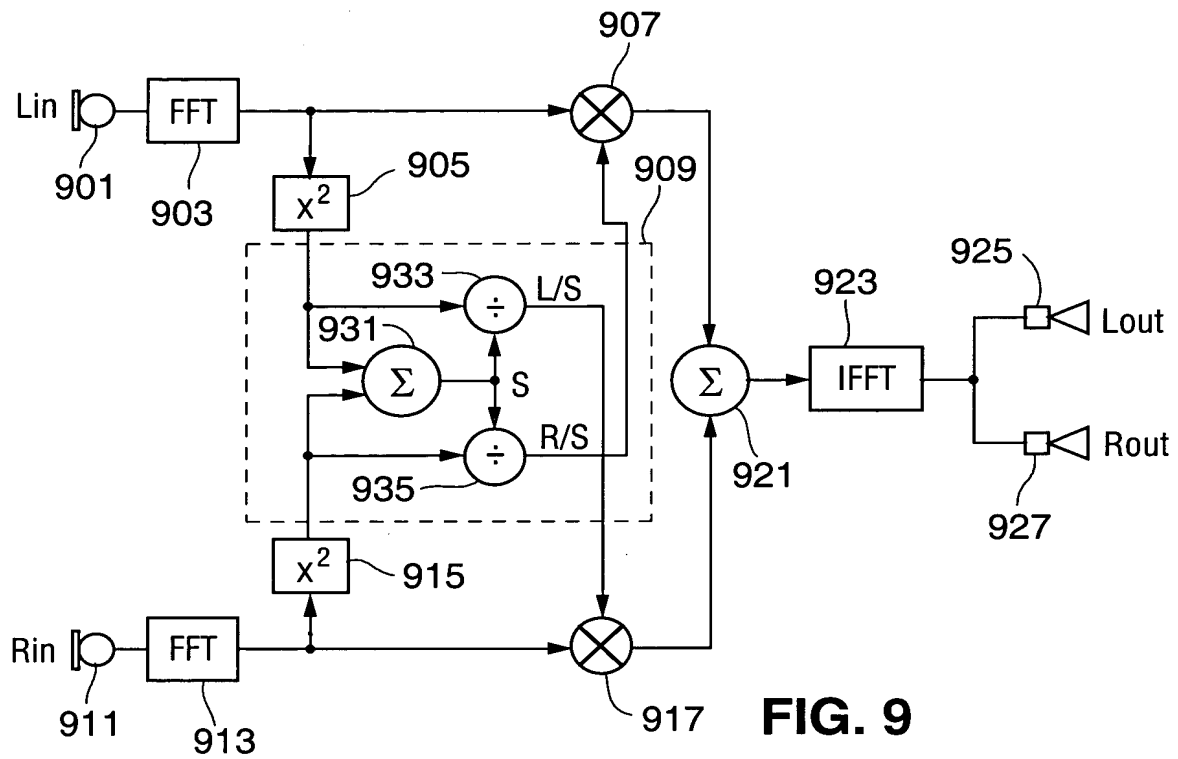


FIG. 9

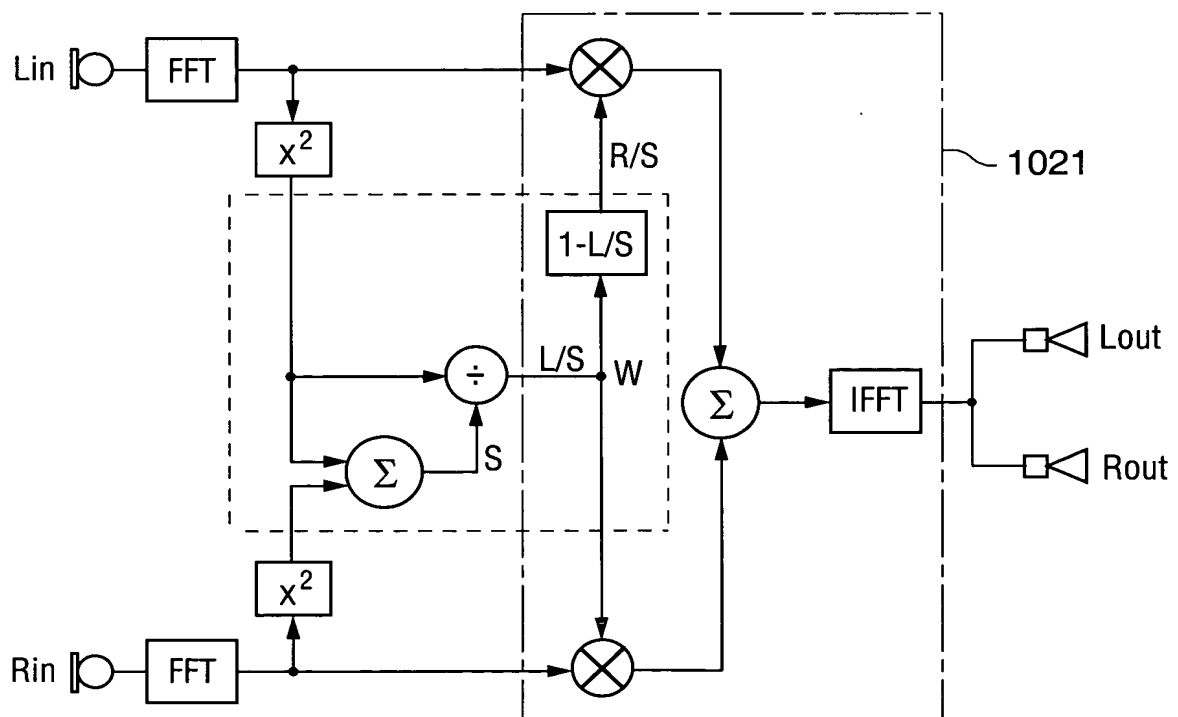


FIG. 10

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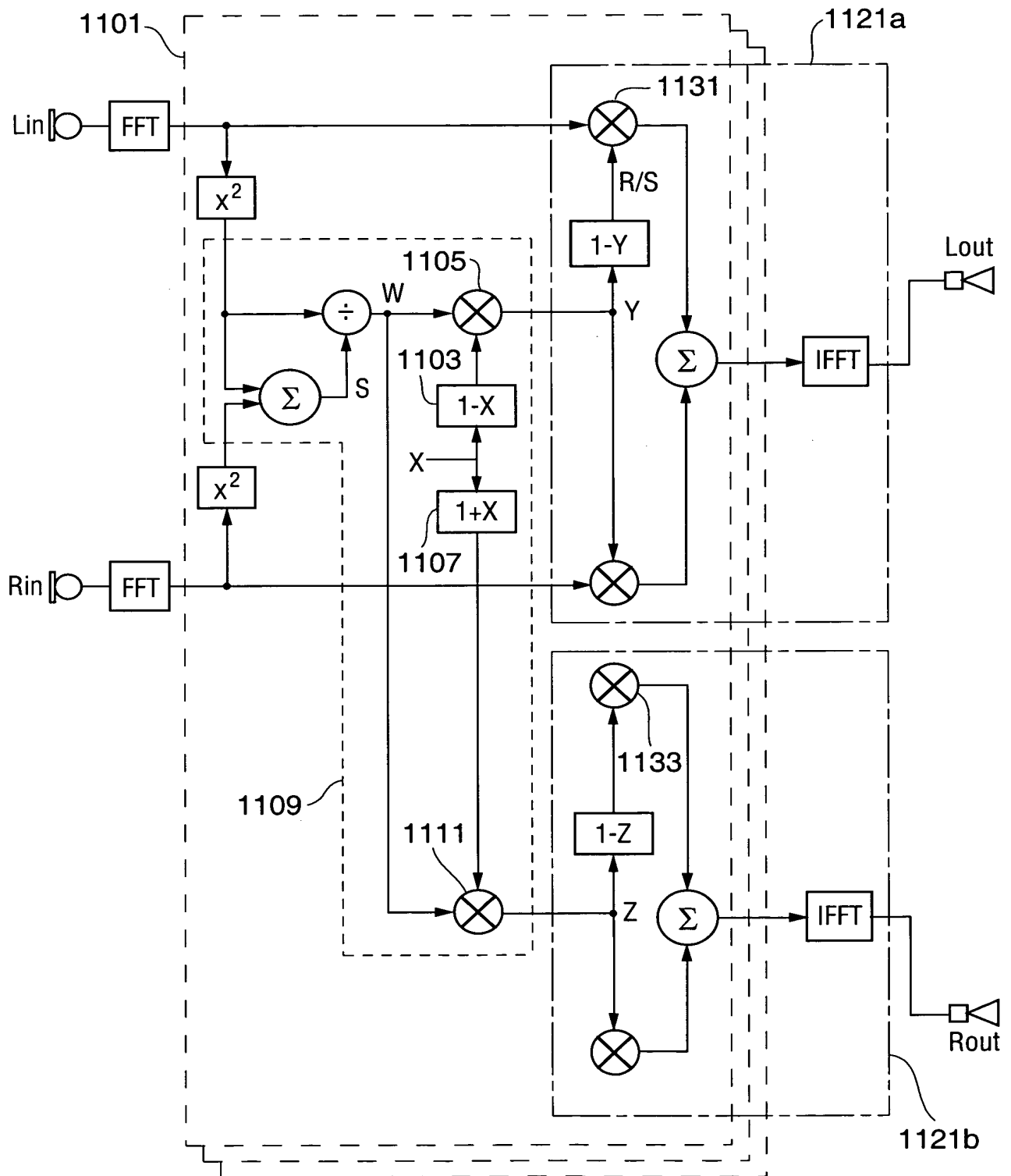


FIG. 11

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BZ5 — BEAMFORMING MODE

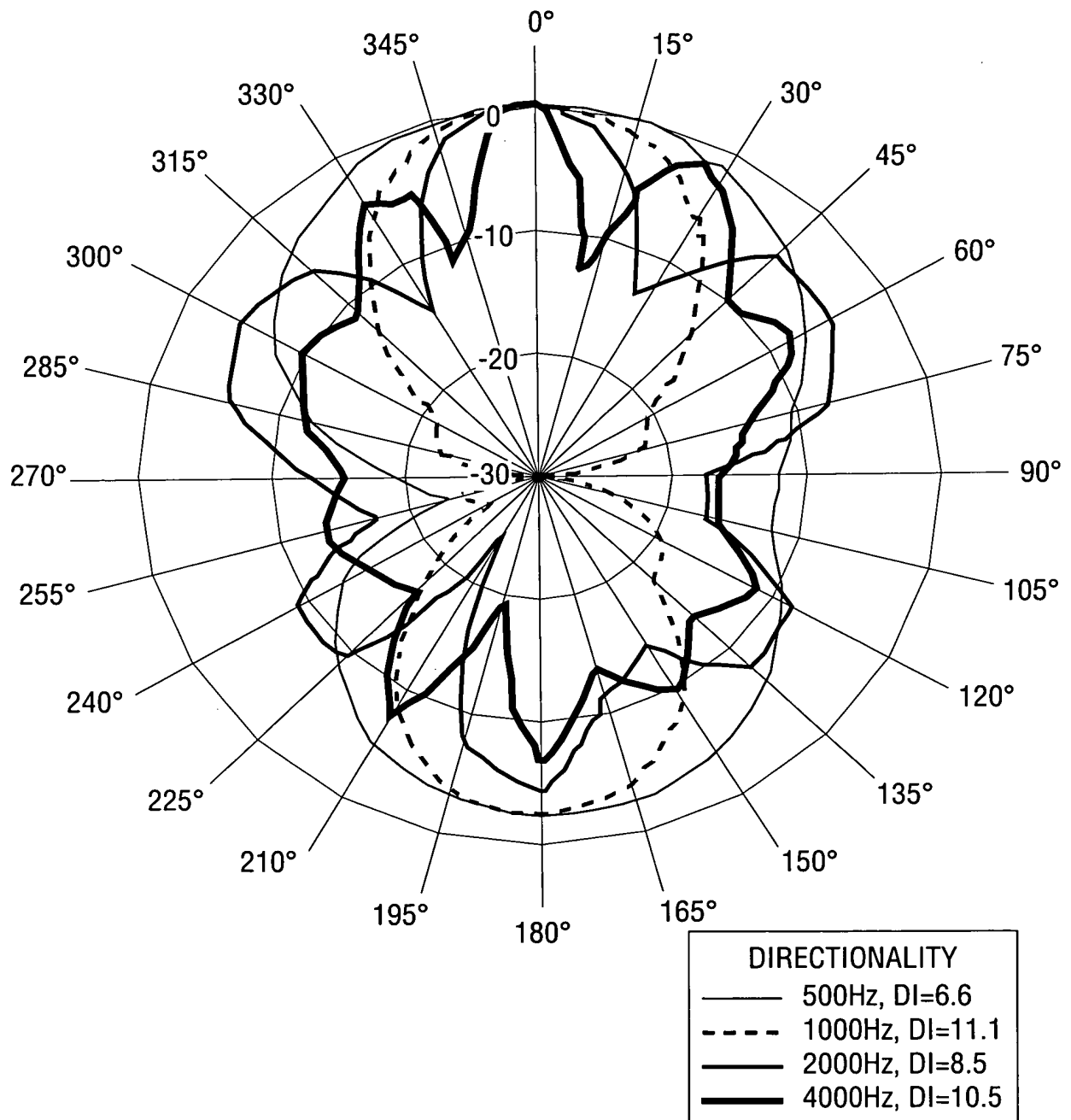


FIG. 12

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BZ-5 IN-SITU RIGHT EAR POLAR RESPONSE

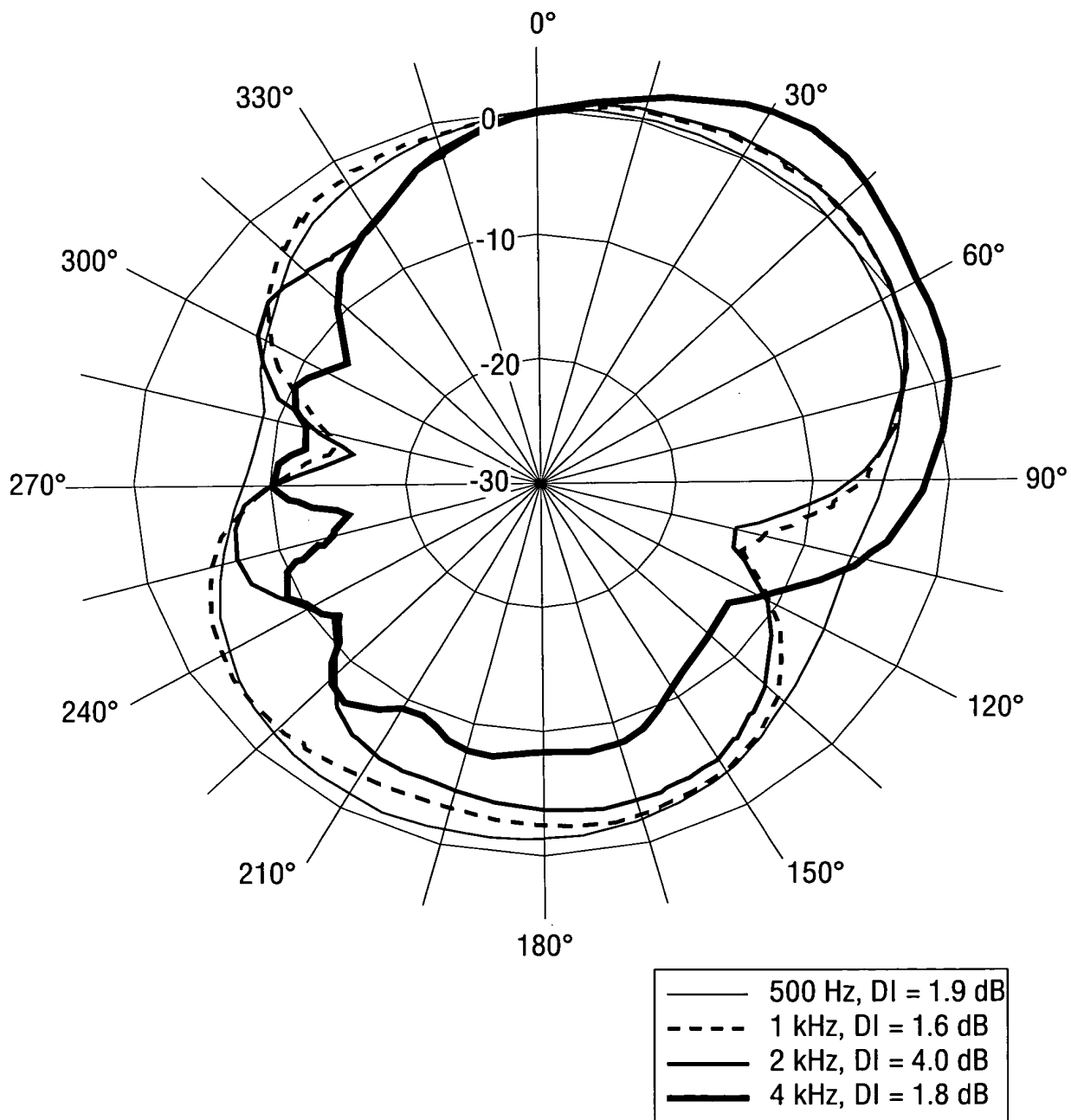


FIG. 13

SECOND ORDER — BEAMFORMING MODE

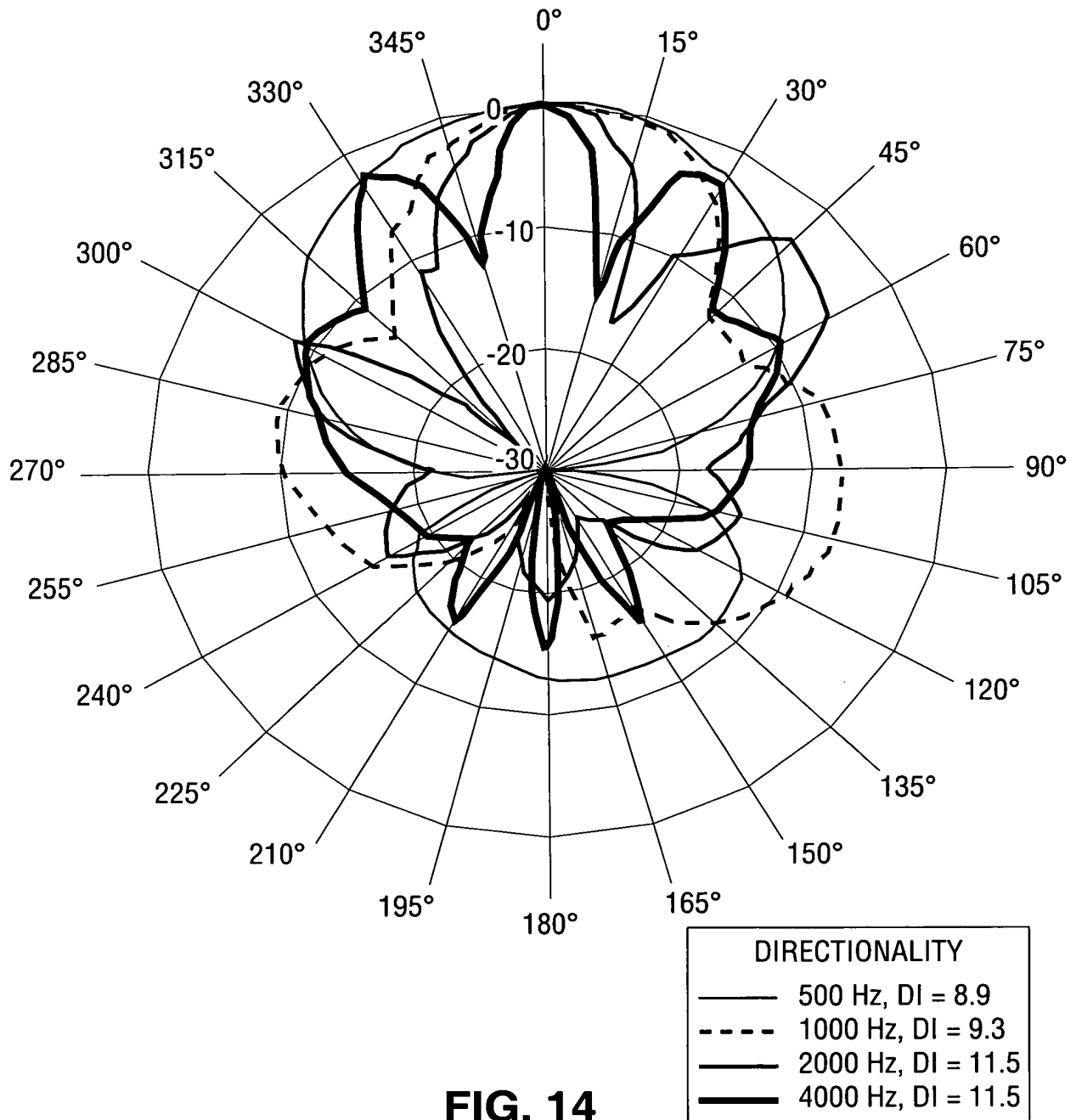


FIG. 14

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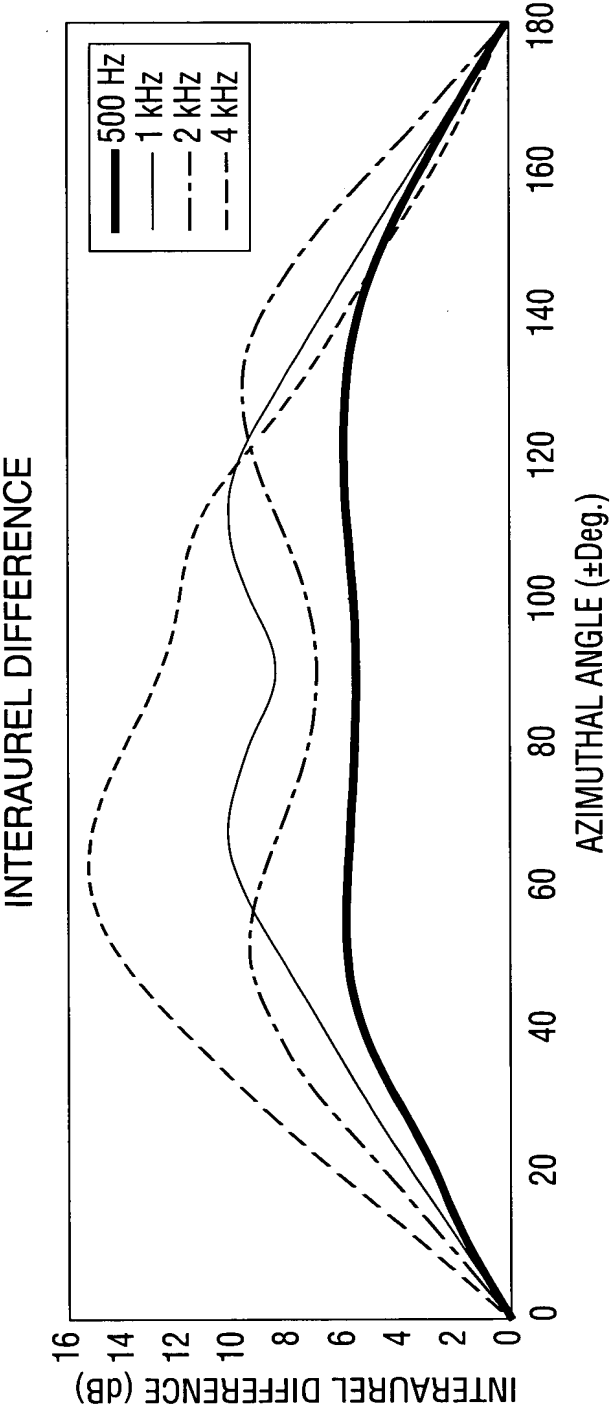
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SHAW DATA— AZIMUTHAL INTERAUREL DIFFERENCE

AZIMUTH ANGLE (Deg.)	IAD@500Hz (dB)	IAD@1-kHz (dB)	IAD@2-kHz (dB)	IAD@4-kHz (dB)
0	0	0	0	0
10	1.4	2.3	1.8	3
20	2.7	4.5	3.5	6.4
30	4	6.8	5.2	9.2
40	5.3	8.5	6.8	12
50	5.9	9.5	8.35	14.1
60	6	9.2	9.8	15.2
70	5.8	8.2	10.3	15
80	5.75	7.4	9.5	14
90	5.6	7	8.6	12.8
100	5.7	7.4	9.5	12.05
110	5.85	8.5	10.3	11.4
120	6	9.3	9.8	9.8
130	5.9	9.8	8.35	7.7
140	5.5	9	6.8	6
150	4.5	7.35	5.2	4.2
160	3.1	4.9	3.5	2.7
170	1.7	2.5	1.8	1.3
180	0	0	0	0

FIG. 15



USING THE 1-kHz PATTERN AS THE DESIRED REFERENCE POLAR PATTERN

FREQ.	ACTION	IAD SLOPE (dB/ADeg.)	PHASE (EDeg. /ADeg.)	PHASE RATE (EDeg./dB)	CORRECTION (EDeg./dB)
AT 500 Hz	DOUBLE THE PHASE RATE	16 dB / 70 Deg. = 0.22857	90 / 60 = 1.5	6.563	6.563
AT 1 kHz	DO NOTHING	16 dB / 120 Deg. = 0.13333	180 / 60 = 3	22.500	0
AT 2 kHz	HALVE THE PHASE RATE	10 dB / 60 Deg. = 0.16667	180 / 30 = 6	36.000	-18
AT 4 kHz	QUARTER THE PHASE RATE	12 dB / 40 Deg. = 0.30000	180 / 15 = 12	40.000	-30

FIG. 18

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BEAMFORMER — AZIMUTHAL DEPENDENCE OF ELECTRICAL PHASE DIFFERENCE

AZIMUTH ANGLE (Deg.)	BF PHASE@500Hz (Deg.)	BF PHASE@1-kHz (Deg.)	BF PHASE@2-kHz (Deg.)	BF PHASE@4-kHz (Deg.)
0	0	0	0	0
5				
10				
15				180
20				
25				
30			180	360
35				
40				
45				
50				
55				
60		180	360	720
65				
70				
75				
80				
85				
90	<180			

FIG. 17

CONTROL SURFACE — ELECTR. DEG.

IAD (dB)	FREQ. (kHz)						
	0.5	1	2	4			
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	6.56	3.28	0.00	-9.00	-18.00	-24.00	-30.00
2	13.13	6.56	0.00	-18.00	-36.00	-48.00	-60.00
3	19.69	9.84	0.00	-27.00	-54.00	-72.00	-90.00
4	26.25	13.13	0.00	-36.00	-72.00	-96.00	-120.00
5	32.82	16.41	0.00	-45.00	-90.00	-120.00	-150.00
6	39.38	19.69	0.00	-54.00	-108.00	-144.00	-180.00
7	45.94	22.97	0.00	-63.00	-126.00	-166.00	-210.00
8	52.50	26.25	0.00	-72.00	-144.00	-192.00	-240.00
9	59.07	29.53	0.00	-81.00	-162.00	-216.00	-270.00
10	65.63	32.82	0.00	-90.00	-180.00	-240.00	-300.00
11	72.19	36.10	0.00	-99.00	-198.00	-264.00	-330.00
12	78.76	39.38	0.00	-108.00	-216.00	-288.00	-360.00
13	85.32	42.66	0.00	-117.00	-234.00	-312.00	-390.00
14	91.88	45.94	0.00	-126.00	-252.00	-338.00	-420.00
15	98.45	49.22	0.00	-135.00	-270.00	-360.00	-450.00
16	105.01	52.50	0.00	-144.00	-288.00	-384.00	-480.00
17	111.57	55.79	0.00	-153.00	-306.00	-406.00	-510.00
18	118.13	59.07	0.00	-162.00	-324.00	-432.00	-540.00
19	124.70	62.35	0.00	-171.00	-342.00	-456.00	-570.00
20	131.26	65.63	0.00	-180.00	-369.00	-480.00	-600.00

FIG. 19

HEARING SYSTEM BEAMFORMER

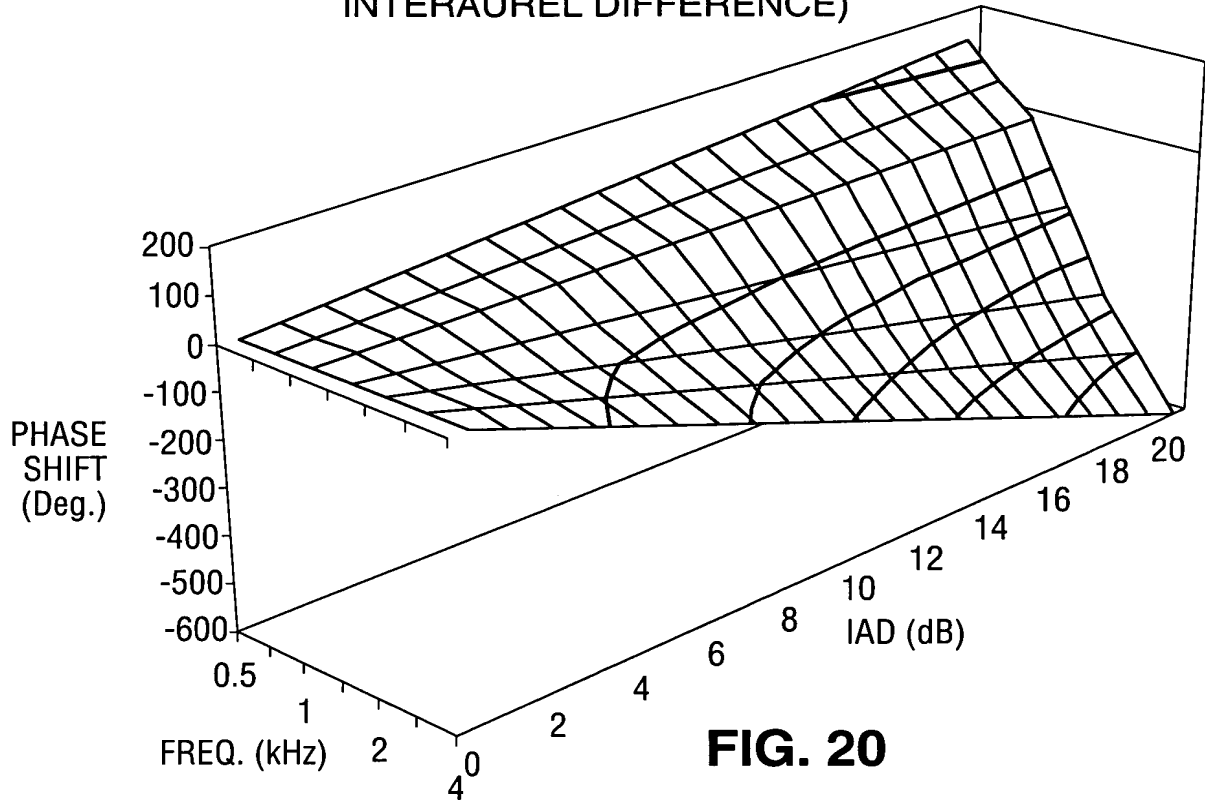
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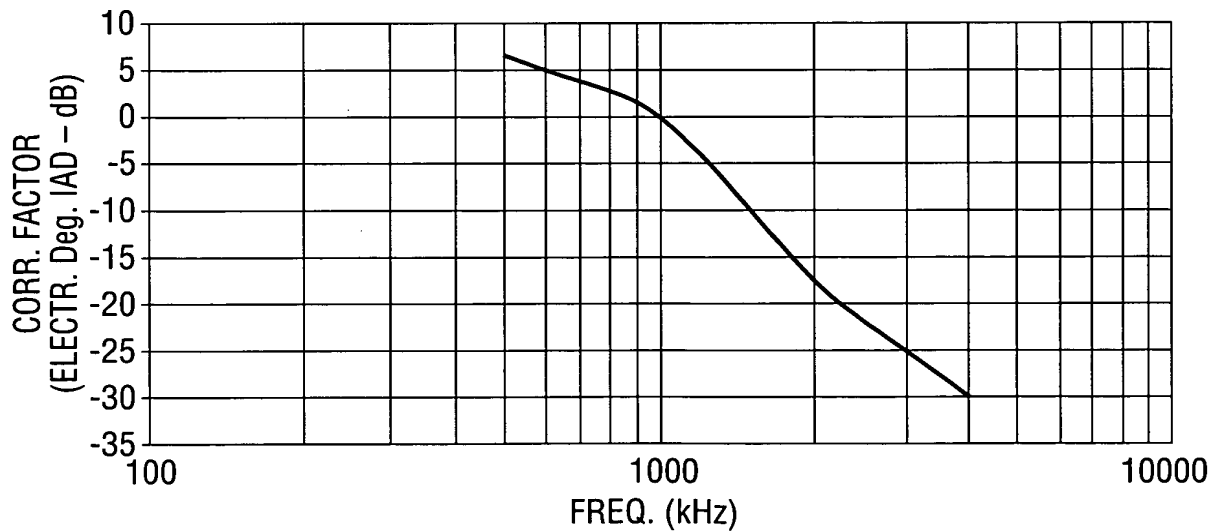
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REQUIRED ELECTRICAL PHASE SHIFT (AS A FUNCTION OF FREQUENCY AND INTERAUREL DIFFERENCE)



CORRECTION SLOPE



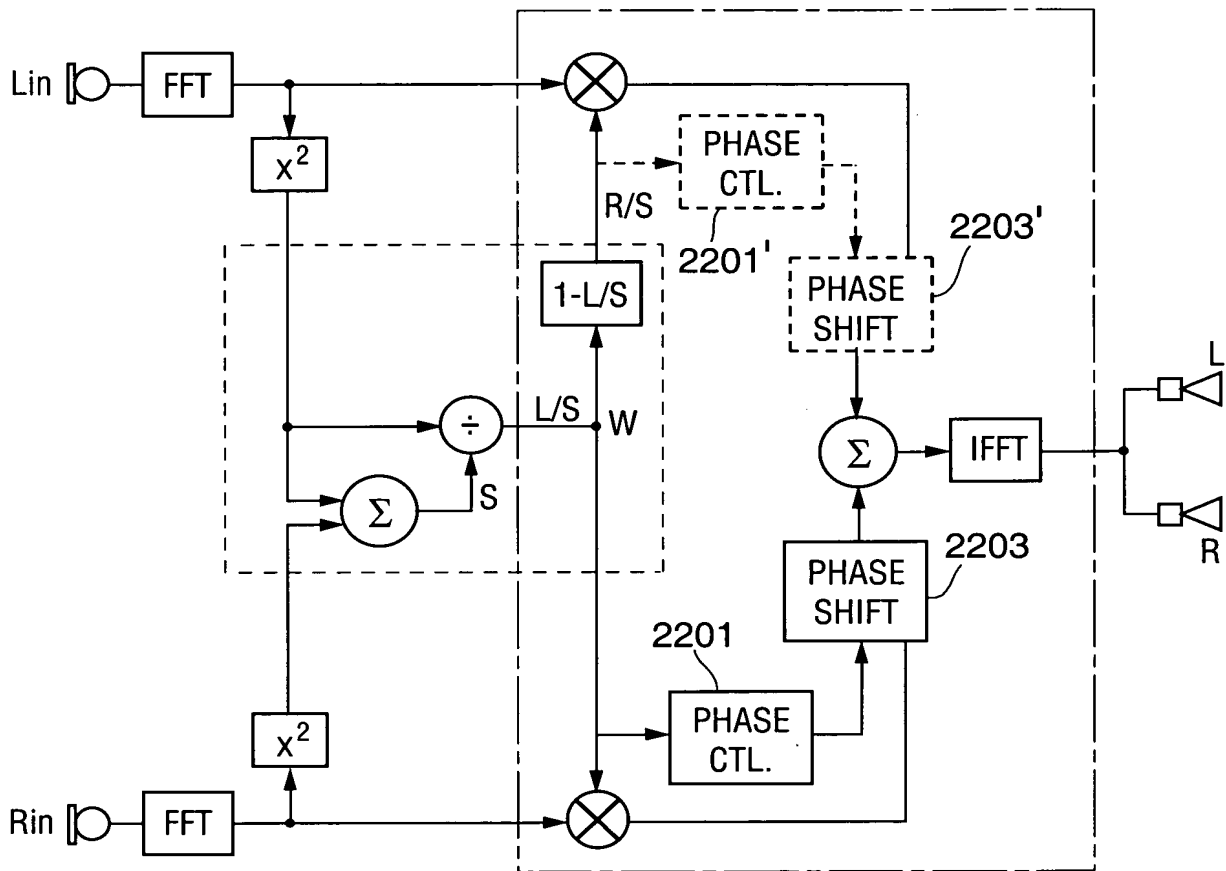


FIG. 22

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FIG. 23

BZ5/PHASE CORRECTED – BEAMFORMING
MODE (CALCULATED)

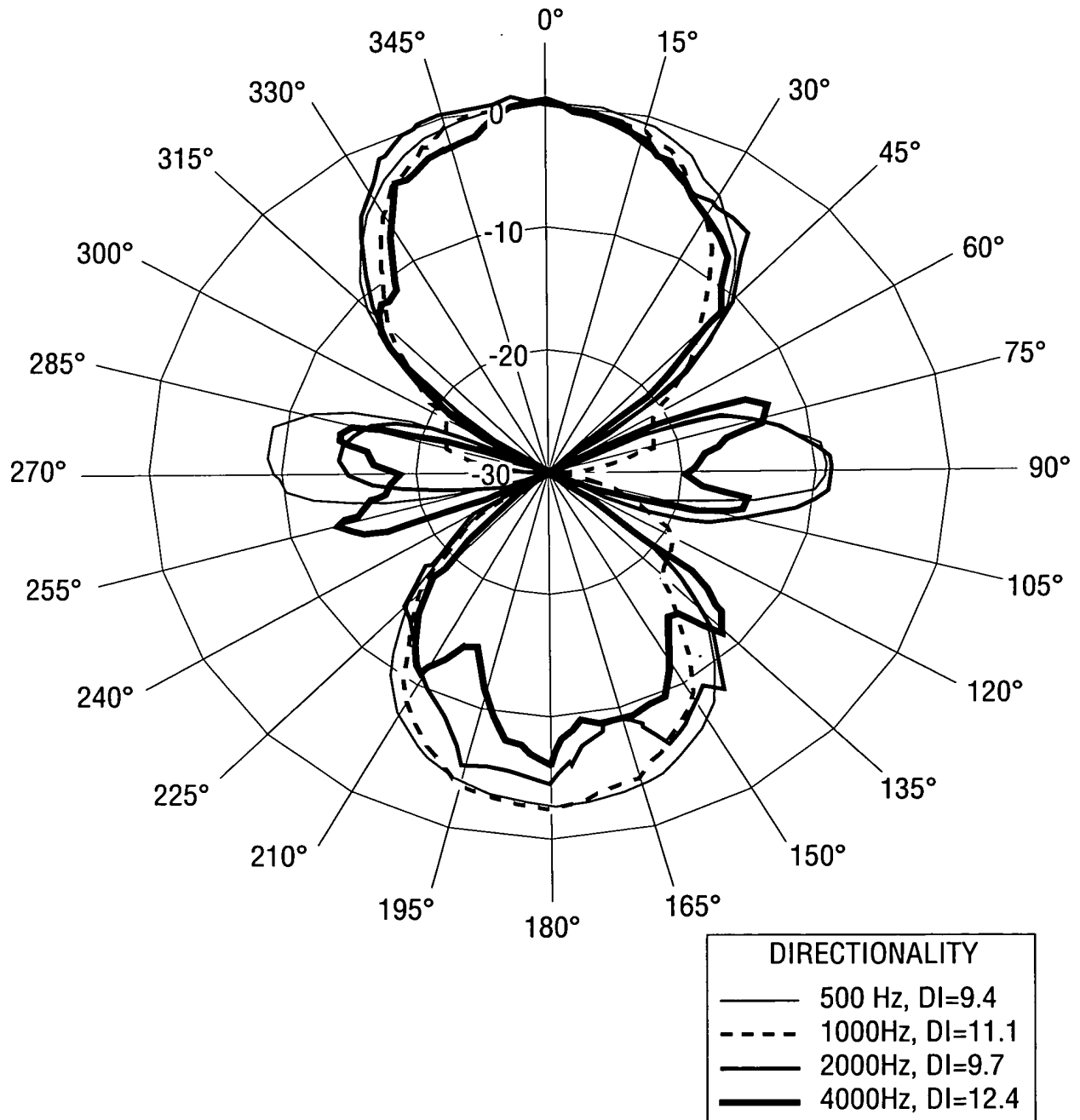


FIG. 24